CLAIMS

1. Sound-absorbing device for placement in a sound field in air, and absorbing acoustic energy from said sound field at least in a predetermined low-frequency region, the device comprising a body containing one or more cavities (4, 12, 13), where at least a portion of the outer surface of the body is in contact with said sound field and where said body is inflatable/extendable and collapsible/compressible during the supply of a gas to or the removal of the gas from said at least one cavity (4, 12, 13), respectively, whereby the absorption coefficient (α) and/or the resonance frequency of said body can be varied, thus determining the absorption coefficient and/or the frequency region in which maximum absorption will take place.

2. Sound-absorbing device according to claim 1, where said low-frequency region has an upper frequency limit of approximately 200 Hz.

3. Sound-absorbing device according to claim 1, where said low-frequency region is 50 Hz to 125 Hz.

4. Sound-absorbing device according to claim 1, where the material of said body is chosen such that there exists a substantial impedance match between the body and the surrounding sound field, at least in said low-frequency region.

5. Sound-absorbing device according to claim 1, where said gas is supplied to/removed from said at least one cavity (4, 12, 13) via a valve provided in a conduit between said at least one cavity and a source of that gas, where the valve is provided with means for remote-controlling the valve.

6. Sound-absorbing device according to any of the preceding claims, where the body is furthermore provided with attachment means (32, 37) for engagement with corresponding attachment means provided on one or more sound-absorbing devices according to any of the preceding claims.

7. Sound-absorbing device according to claim 1, where at least one of said at least one cavities (4, 12, 13) is provided with sound-absorbing material (3) within said cavity.

8. Sound-absorbing device according to claim 1, where said at least one cavity is provided with internal self-inflating/self-expanding means.

9. Sound-absorbing device according to claim 1, where said bodies are surrounded by an inflatable/expandable and collapsible/compressible frame structure (8, 15', 15") for providing sufficient rigidity and/or the desired shape and/or the desired depth to said bodies.

10. Sound-absorbing assembly comprising at least one sound-absorbing device according to any of the preceding claims 1 to 9, the assembly comprising a support or suspension structure (41) provided with roller means (43) upon which said devices can be wound and drive means for rotating said roller means (43).

11. Sound-absorbing assembly according to claim 10 furthermore comprising at least one high-frequency absorbing means (46) supported on the support or suspension structure (41) on one or more second roller means (47) upon which said high-frequency absorbing means (46) can be wound.

12. Sound-absorbing assembly according to claim 10 or 11, where the support or suspension structure (41) is formed as a housing for accommodating the low and high-frequency absorbing devices in an inactive state of the assembly.

13. Sound-absorbing assembly according to claim 10, 11 or 12, where the assembly furthermore is provided with means for automatically winding up at least the low-frequency absorbing device (42) in case of fire.

14. Sound-absorbing assembly according to claim 11, where said high-frequency absorbing device (46) is a sheet of fabric of a material with sufficient flow resistance to provide high-frequency acoustic absorption.

15. A method for absorbing sound from a sound field in air, comprising introduction of at least one at least partially resilient body, characterised by an acoustic mass and compliance determining a resonance frequency and hence an active frequency region for substantial absorption of acoustic energy from said sound field and an outer surface exhibiting a chosen acoustic resistance, into said medium, such that

said medium is in contact with at least a portion of an outer surface of said at least one body, whereby said at least one body will absorb acoustic energy from said sound field,

characterised in that

at least one of said bodies is/are inflatable/extendable and collapsible/compressible during the supply of a gas to or the removal of gas from said at least one cavity, respectively, whereby the absorption coefficient (α) and/or the resonance frequency of said body can be varied, thus determining the frequency region in which maximum absorption will take place.

16. A method according to claim 15, characterised in that the acoustic resistance of those portions of said one or more bodies that is/are in contact with said sound field is chosen such that a substantial impedance match exists between these portions and the surrounding sound field.

17. A method according to claim 15 or 16, where the resonance frequency f_o, acoustic resistance ratio □, maximum absorption coefficient α_{max} and absorption bandwidth Br are given by

$$f_0 = \frac{c}{2\pi}\sqrt{\frac{\rho}{md}} \qquad (1)$$

$$\mu = \frac{r_i}{r_s} \qquad (2)$$

$$\alpha_{\max} = \frac{4\mu}{(1+\mu)^2} \qquad (3)$$

$$\frac{B_r}{f_0} = (1+\mu)\sqrt{\frac{\rho d}{m}} \qquad (4)$$

18. A method for reducing the reverberation time of a room at least in a low-frequency region from a given reverberation time (T_{60}) to a desired reverberation

time ($T_{60.S}$) comprising the introduction of one or more devices according to any of the preceding claims 1 to 9, or one or more of the sound-absorbing assemblies according to any of the preceding claims 10 to 14 into the room.

19. A method according to claim 18, where the required total surface area S_s of said one or more bodies is determined by the equation

$$\alpha = \frac{55.3V}{cS_s}\left(\frac{1}{T_{60}^{S}} - \frac{1}{T_{60}}\right) \qquad (5)$$

where α_s is the absorption coefficient of the absorbing device/devices, V is the volume of the room and c is the speed of sound.

20. A method according to claim 18, where said reduction of reverberation time predominantly takes place in a low-frequency region determined by a resonance frequency and absorption bandwidth determined according to claim 17.

21. A system for reducing the reverberation time of a room comprising a plurality of sound-absorbing devices according to any of the preceding claims 1 to 9, or/and a plurality of sound-absorbing assemblies according to any of the preceding claims 10 to 14, the system furthermore comprising conduits through which gas can be supplied from a source to each of said devices or/and assemblies either individually or in predetermined groups of said devices or assemblies and removed from these.

22. A system according to claim 21, where said devices or/and assemblies are provided with valve means for controlling the supply of gas to/removal of gas from said devices or assemblies.

23. A system according to claim 22, where said valve means are remote controllable and where the system is furthermore provided with a central control device for controlling the degree of inflation/extension of said devices or assemblies.

24. A system according to any of the preceding claims 21 to 23, where the system furthermore comprises means for measuring the reverberation time of a room in which the system is installed.

25. A system according to any of the preceding claims 21 to 24 furthermore comprising data storage means for storing for instance measured reverberation times and various corresponding parameters of the devices or/and assemblies.

26. A listening room, for instance to be used for the performance of live or recorded music, comprising one or more of said sound-absorbing devices according to any of the preceding claims 1 to 9, or/and one or more of said sound-absorbing assemblies according to any of the preceding claims 10 to 14, or/and said system according to any of the preceding claims 21 to 25.

27. The use of sound-absorbing devices according to any of the preceding claims 1 to 9 for altering the reverberation time of a room.

28. The use of sound-absorbing assemblies according to any of the preceding claims 10 to 14 for altering the reverberation time of a room.

29. The use of the system according to any of the preceding claims 21 to 25 for altering the reverberation time of a room.